Developmental Screening by the Cognitive Adaptive Test/Clinical Linguistic and Auditory Milestone Scale (CAT/CLAMS) in HIV- Infected Children

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Bayley Scales of Infant Development (BSID) is considered to be a standard test for child development. The test requires experienced evaluator and is time consuming; therefore, it is not easy to apply in busy clinic. The Cognitive Adaptive Test/Clinical Linguistic and Auditory Milestone Scale (CAT/CLAMS) is an easy assessment method that has been demonstrated to correlate with BSID in many studies among normal and developmental delayed children, including in HIV-infected infants. We created a pilot system of CAT/CLAMS assessment applied to 16 HIV-infected infants ages 12-34 months. They were all in the normal range score of developmental quotient (DQ). However, longitudinal follow-up by CAT/CLAMS assessment is needed in these HIV-infected children. When DQ score is below 70 (assuming to be delayed development), the child should be evaluated by BSID. In this way delayed development can be screened easily and early developmental stimulation program can be implemented appropriately.

HIV virus is a lymphotropic and neurotropic virus. Delayed in neurodevelopmental milestones can be the first presenting symptom[1-2]. Symptoms varied from mild, such as abnormal muscle tone to severe, such as progressive developmental delay or loss of previously acquired milestone. These symptoms could be detected as early as 6 month of age[3].

The Bayley Scales of Infant Development (BSID) are the frequently used assessment method to evaluate neurodevelopment in infants and young children. However, the test is time consuming (30-45 minute administration time) and requires experienced personnel to apply and interpret. These make the test unable to implement routinely in general practice.

The Cognitive Adaptive Test / Clinical Linguistic and Auditory Milestone Scale (CAT/CLAMS) was designed for use by primary pediatric health care providers to screen children for cognitive delay using minimal equipment in shorter time (usually 15-20 minutes)[4]. Correlation between CAT/CLAMS and BSID has been demonstrated in normal children as well as high risk groups of developmental delayed children between 1 to 36 months of age[5-6].

This study aimed to evaluate CAT/CLAMS as a screening tool for detection of developmental problem HIV-infected children in our HIV clinic. The patients with abnormal CAT/CLAMS assessment were then confirmed by BSID and were treated appropriately.

Material and Method

We initiated neurodevelopmental assessment program using CAT/CLAMS in HIV-infected children who were followed at Siriraj Hospital, Bangkok.

HIV infected children, diagnosed by either two positive DNA PCR at any time or positive HIV anti-

body after 18 months of age were enrolled. At the time of assessment, subjects did not have any acute illness and visited the clinic for antiretroviral therapy. The CAT/CLAMS assessment was applied by either one of the investigators (PT or NK).

CAT/CLAMS is a 100-item scale administered in two parts and is obtained through observation. CAT consists of visual-motor problem solving items performed directly with the child. CLAMS items consist of language acquisition. The test is performed in sequential fashion until the basal age is reached, i.e, when two consecutive months of items were all scored positive. Items would continue to be presented to the patient until the items of the next two consecutive months of were all unable to attain. This report is the result of one-time cross-sectional assessment.

Scoring:-

Developmental quotient on visual motor problem solving (CAT DQ) is CAT age divided by chronological age, then multiplied by 100. Developmental quotient in language (CLAMS DQ) is CLAMS age divided by chronological age, then multiplied by 100. CAT/CLAMS-r developmental quotient is the arithmetic mean of CAT DQ and CLAMS DQ.

Interpretation: -

The DQ of 85 to 120 is normal; 70 to 85 is borderline; under 70 is delayed. Discrepancies between CAT DQ and CLAMS DQ may be seen in communicative disordered child.

Results

Sixteen HIV infected children were assessed. Their age range was between 12 to 34 months. Eight patients were male (13-34 months old) and eight were female (12-32 months old). Most of the males (5 of 8) were younger than 19 months of age while seven of eight females were older than 19 months of age. The CAT/CLAMS was successfully performed in every child and finished within 15-20 minutes. The DQ score of CAT CLAMS and CAT /CLAMS-r were displayed in Table 1. All except one child had DQ score less than 85. There were 3 children who had CAT DQ and CLAMS DQ difference of > 10.

Discussion

CAT/CLAMS assessment is an easy and feasible test for general practitioners. Personnel can be trained to perform the test within 2-3 hours. CAT/CLAMS assessment has 66-88 % sensitivity and

Table 1. DQ of CAT, CLAMS and CAT/CLAMS-r of 16 HIV infected children

Gender	Chronological Age (Month)	CAT		CLAMS		CAT/CLAMS-r
		Basal age	DQ	Basal age	DQ	DQ
M	12*	10.3	85.8	11.5	95.8	90.8
	14	14.0	100.0	14.0	100.0	100.0
	16	17.0	106.2	17.0	106.2	106.2
	18	20.0	111.1	18.5	102.8	106.9
	18	20.0	111.1	17.0	94.4	102.8
	20	20.0	100.0	18.5	92.5	96.2
	20	17.0	85.0	17.0	85.0	85.0
	32	30.0	93.7	28.5	89.0	91.4
F	13*	16.2	124.6	13.0	100.0	112.3
	19	19.0	100.0	18.0	94.7	97.3
	19	21.7	114.2	21.0	110.5	112.3
	19*	20.4	107.3	17.0	89.4	98.4
	27	27.0	100.0	25.5	94.4	97.2
	28	26.3	93.9	30.0	107.1	100.5
	32	34.5	107.8	36.0	112.5	110.5
	34	27.0	79.4	26.0	76.4	77.9

* Discrepancies between CAT-CLAMS DQ ≥ 10

67-85% specificity[7-9] when compared with BSID, with the cut-off score below 70 for developmental delayed. The prevalence of neurodevelopmental manifestations of HIV infection has been reported in several series to vary between 8% and 62%[10]. From this study, we found only 1 of 17 children that had score <85, and no one had score <70. It could be that the sample size in this report was too small. Moreover, we found 3 children with slightly over 10 score DQ discrepancies who might have communicative disoders. Therefore we need to repeat the test again during follow-up period in order to detect more subtle abnormality. The assessment is more reliable in older children.

In conclusion, we found that CAT/CLAMS, is an easy and practical screening neurodevelopmental assessment test for HIV-infected children in outpatient setting. With the ease of this test, we are able to cooperate it into routine practice, and would be able to early detect children with delayed development who will be benefit from early stimulation program.

Acknowledgement

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การนำ CAT/CLAMS มาตรวจคัดกรองหาภาวะพัฒนาการล่าช้าในผู้ป่วยเด็กที่ติดเชื้อ HIV

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Bayley Scales of Infant Development (BSID) เป็นเครื่องมือที่ยอมรับในการประเมินดูภาวะการณ์พัฒนาการช้าของเด็กเล็กที่ได้มาตรฐาน แต่เพราะต้องอาศัยผู้เชี่ยวชาญที่ผ่านการอบรม และเสียเวลาในการประเมินนาน ควรต้องมีการตรวจคัดกรองเพื่อเลือกเฉพาะผู้ป่วยที่น่าจะมีปัญหา ก่อนมาทำการประเมินด้วย *BSID. The Cognitive Adaptive Test/Clinical Linguistic and Auditory Milestone Scale (CAT/CLAMS)* เป็นเครื่องมือคัดกรองภาวะดังกล่าวที่ไม่ต้องอาศัยผู้เชี่ยวชาญขนาดนั้น และเวลาที่ใช้ประเมินสั้นกว่า จึงได้มีการนำมาเริ่มใช้กับผู้ป่วยเด็กติดเชื้อโรคภูมิคุ้มกันบกพร่อง *(HIV)* ที่มารับการรักษาที่คลินิกเฉพาะโรคภาควิชากุมารเวชศาสตร์ โรงพยาบาลศิริราช ผลการตรวจเด็กติดเชื้อโรคภูมิคุ้มกันบกพร่อง 16 ราย ด้วย *CAT/CLAMS* พบว่าอยู่ในคะแนน *DQ* ปกติ แต่ต้องทำการตรวจติดตามต่อไปด้วยการทำ *CAT/CLAMS* เป็นระยะ และถ้าพบผิดปกติ คือต่ำกว่า *DQ score 70* ควรส่งตรวจ *BSID* เพื่อยืนยัน โดยวิธีนี้จะสามารถตรวจพบเด็กที่มีพัฒนาการล่าช้าได้รวดเร็วอย่างง่ายดาย เพื่อจะส่งเข้าโปรแกรมการกระตุ้นพัฒนาการต่อไป